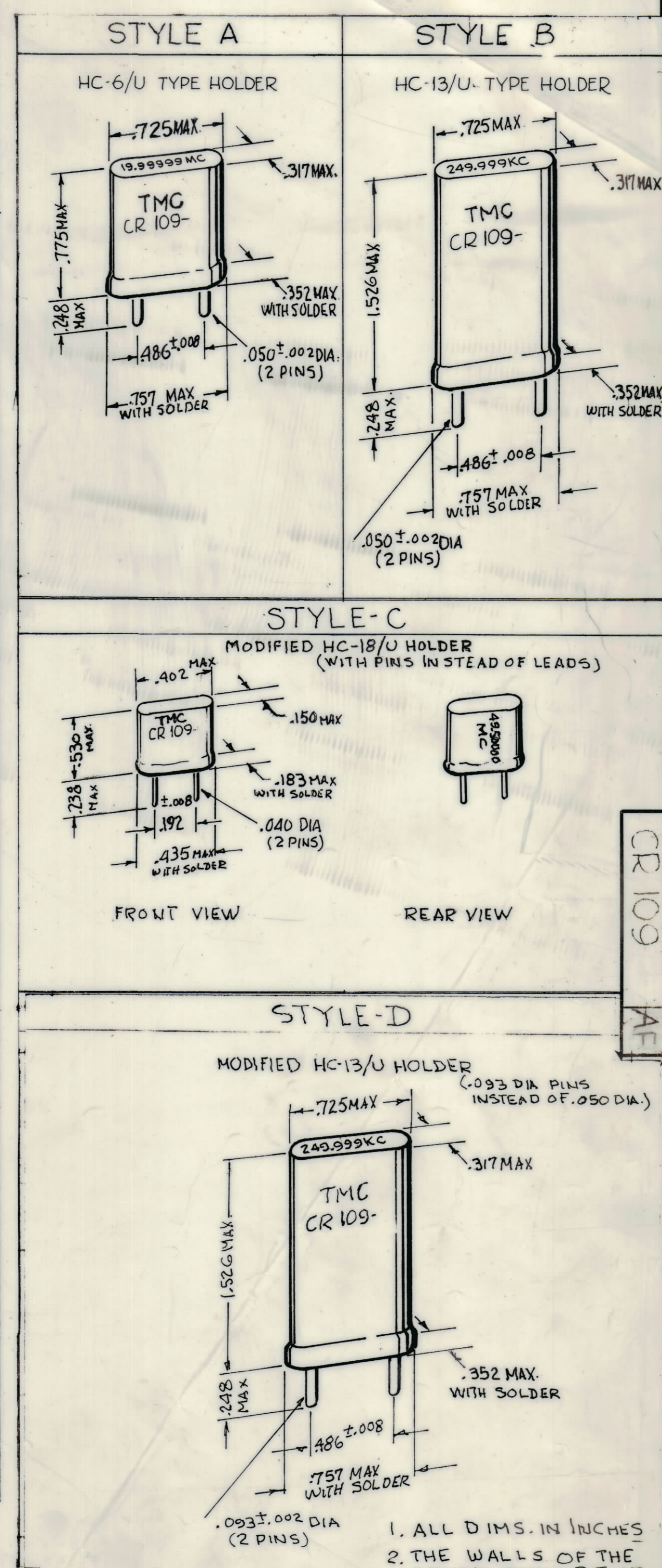


REVISIONS						
BY	DATE	DESCRIPTION	DATE	E.M.N. NO.	DRAFT	CHKD
AB	5/21/68	SEE SHEET 2	18934			FB
AC	5/24/68	SEE SHEET 2	19152			FB
AD	5/24/68	SEE SHEET 2	19689			FB
AE	5/21/68	ADDED CR109-154 TO SHT. 2	20162			FB
AF	6-7-71	SEE SHEET 2 OF 2	20375			FB

TMC PART NO.	HOLDER TYPE	PICTORIAL STYLE	COLUMN F FREQUENCY STAMPING INFORMATION (STAMP CRYSTAL UNIT WITH FREQUENCY SHOWN IN COLUMN INDICATED BELOW)	COLUMN S SERIES RESONANT FREQUENCY	COLUMN P PARALLEL RESONANT FREQUENCY	RESONANCE LOAD CAPACITY	FREQ. TOL. AT OPERATING TEMPERATURE	OPERATING TEMPERATURE RANGE	FREQUENCY DEVIATION OVER OPERATING TEMP. RANGE	OPERABLE TEMPERATURE RANGE	TURNOVER TEMPERATURE	HARMONIC OF QUARTZ VIBRATION	RATED DRIVE LEVEL	PIN TO PIN CAPACITANCE MAX. UNLESS TOLERANCE INDICATES MIN. VALUE ALSO	MAXIMUM EFFECTIVE RESONANCE RESISTANCE AT OPERATING TEMPERATURE OHMS	REMARKS	USED ON MODEL
CR 109-1	HC-6/U	A	COLUMN "P"	1.25000MC	1.250130 MC	32 ^{±.5} pf	±.002%(75°C)	75° ± 5°C.	0.0005%	0°C. to +90°C.	75° + 5°C.	FUNDAMENTAL	5 MW	3.0-4.0 pf	400@ (75°C)		AFC-2, 3 Y5000
2				1.499800MC	1.500000 MC								5 MW	3.1-4.1 pf	400		AFC-2, 3 Y5001
3				9.998750MC	10.000000 MC								2.5 MW	5.0-6.2 pf	25		AFC-2, 3 Y5002
4				10.70275 MC	10.705000 MC								2.5 MW	3.0-4.0 pf	25		AFC-2 Y5003
5	HC-6/U	A		11.99740 MC	12.000000 MC	32 ^{±.5} pf	±.002%(75°C)	75° ± 5°C.	0.0005%	0°C. to +90°C.	75° + 5°C.		2.5 MW	3.4-4.4 pf	25@ (75°C)	TEST NOTE # 1	AFC-2 Y5003
6	HC-13/U	B			3.100 KC	10 ^{±.5} pf	±.0%	25° ± 5°C.	±.0005%	0°C to +65°C.			.1 MW	16.0 pf	350,000 (25°C)		HFS-1
7					3.200 KC												
8					3.300 KC												
9					3.400 KC												
10					3.500 KC												
11					3.600 KC												
12					3.700 KC												
13					3.800 KC												
14					3.900 KC												
15					4.000 KC												
16					27.000 KC												
17					28.000 KC												
18					29.000 KC												
19					30.000 KC												
20					31.000 KC												
21					32.000 KC												
22					33.000 KC												
23					34.000 KC												
24					35.000 KC												
25	HC-13/U	B			36.000 KC								.1 MW	12.0 pf	50,000		
26	HC-6/U	A			320.000 KC								2.0 MW	7.0 pf	3,500		
27					330.000 KC												
28					340.000 KC												
29					350.000 KC												
30					360.000 KC												
31					370.000 KC												
32					380.000 KC												
33					390.000 KC												
34					400.000 KC												
35					410.000 KC												
36					2.900000 MC												
37					3.000000 MC												
38					3.100000 MC												
39					3.200000 MC												
40					3.300000 MC												
41					3.400000 MC												
42					3.500000 MC												
43					3.600000 MC												
44					3.700000 MC												
45	HC-6/U	A			3.800000 MC												
46	SPECIAL	C			48.50000 MC	10 ^{±.5} pf	±.0%					FUNDAMENTAL	5 MW		250 (25°C)		
47					49.50000 MC	10 pf	±.005%					3rd or 5th	2.0 MW		55 (25°C)		
48					50.50000 MC												
49					51.50000 MC												
50					52.50000 MC												
51					53.50000 MC												
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71					73.50000 MC												
72					74.50000 MC												
73					75.50000 MC												
74					76.50000 MC												
75	SPECIAL	C	COLUMN "P"		77.50000 MC	10 pf	±.05%(25°C)	25°C ± 5°C.	±.0005%	0°C to +64°C		3rd or 5th	2.0 MW	7.0 pf	55 (25°C)		HFS-1
76	HC-13/U	B	COLUMN "P"		100.000 KC	10 pf	±.01%		±.005%	-40°C to +70°C		FUNDAMENTAL	2 MW	Not Specified	10,000	Use CR 20 A/U	GRB-92
77	HC-6/U	A	COLUMN "P"		705.000 KC	32 ^{±.5} pf	±.002%(75°C)	70°C ± 5°C.	±.0005%	0°C to +90°C.		FUNDAMENTAL	5 MW	7.0 pf	1,000@75°C		SBS-1
78	SPECIAL	D	COLUMN "S"				±.02%(25°C)	0°C to +65°C.	±.02%	0°C to +65°C.		FUNDAMENTAL	1.5 MW	Not Specified	1500 MAX @ 25°C	SUPERSEDES CR-106	DVM-2,3,4
79	HC-6/U	A	COLUMN "P"		438.000 KC	20 pf	±.002%(75°)	75°C ± 5°C	±.0005%	-40°C to +80°C	75°C ± 5°C	FUNDAMENTAL	2 ± .5 MW	NOT SPECIFIED	3,000 Ω		MSR-5,9
CR 109-80	HC-6/U	A	COLUMN "P"		472.000 KC	20 pf	±.0027%(75°)	75°C ± 5°C	±.0005%	-40°C to +80°C	75°C ± 5°C	FUNDAMENTAL	2 ± .5 MW	NOT SPECIFIED	3,000 Ω		MSR-5,9



MANUFACTURING AND TEST NOTES:

- Manufactured in accordance with MIL-C-3098C and Amendments.
- Test will be made with Test Equipment Type TS-350/TSM (for 800 KC to 14,999,999 KC) or TS-710/TSM (for 3 KC to 11,000 KC).
- Holders shall conform (construction, etc.) to MIL-C-3098C and MIL-H-10056.

MARKING NOTES:

- All marking, except "TMC, CR-109-X," shall be etched, metal stamped, branded or engraved.
- All units shall be marked with the month and year of the last manufacturing test, ± ten days, (e.g. 1-61; 12-61) using any method

and location convenient to the manufacturer.

- All units shall be marked with the mfrs. code or name in any location convenient to mfr.
- The frequency which shall be stamped on the crystal unit may be found by referring to Column "F" in chart.
- If the specified frequency (as per Note three) is less than 10 MC per second the frequency marking shall consist of all digits, through cycles per seconds (e.g., 9.000750 MC; 3.120 KC). If the specified frequency is 10 MC per second or more, the frequency marking shall consist of the first seven digits (e.g., 10.70275 MC; 75.30580 MC).
- Frequencies below 1 MC per second shall be expressed in Kilocycles per second (KC/sec) and frequencies of 1 MC per second and above shall be

expressed in Megacycles per second (MC/sec).

- All units will be marked with the letters "TMC" and the TMC Part Number as specified in chart and shown in Pictorials (e.g., TMC CR-109-10). The marking shall be rubber stamped with black ink, silk screened, or an equivalent process and shall have a clear coating to prevent removal of stamping. Coating shall not interfere with operation of crystal unit.

TOLERANCE NOTES:

- All Frequency Tolerances shown with ▲ symbol apply to the Series Resonant Frequency only.

TEST NOTES:

- GROUND CRYSTAL CASE DURING TESTING
- CRYSTAL UNITS CR109-90 THRU CR109-140 MUST MAINTAIN THEIR SPECIFIED RESISTANCES OVER THE OPERATING TEMPERATURE. NO ADJUSTMENTS ARE ALLOWED TO THE CI METER WHILE CRYSTAL UNIT IS BEING SUBJECTED TO TEMPERATURE EXTREMES.

STANDARD DRAWING

NOTES

THE CONTENTS OF THIS DRAWING ARE THE EXCLUSIVE PROPERTY OF THE TECHNICAL MATERIEL CORP. ITS UNAUTHORIZED USE OR REPRODUCTION IN WHOLE OR IN PART IS STRICTLY FORBIDDEN.

REQD.	ITEM	PART NUMBER	DESCRIPTION	SYMBOL
STRONIER LIST OF MATERIAL				
THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK				
CRYSTAL UNIT, QUARTZ (SPECIALS)				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES		DRAWN DATE		
DECIMALS ±.05		CHECKED DATE		
FRACTIONS ± 1/64		DATE		
TOLERANCES ±.005		MECH. DES. DATE		
ANGLES ±				

REVISIONS						
NO.	BY	DESCRIPTION	DATE	E.M. NO.	DRAFT	CHKD
AD	AC	CR109-151, -152, -153 ADDED	5/2/68	17934		FB
AD	AD	ON CR109-90, -91, -150. 0.02% WAS. 0.03% REMARKS DELE.	9/24/68	19689	KLH	OP
AE	AE	ADDED CR109-154	4/1/70	20162	GE	RE
AF	AF	CHG. CR109-86 & 87	6-7-71	20375	RZ	RE

TMC PART NO.	HOLDER TYPE	PICTORIAL STYLE	COLUMN F FREQUENCY STAMPING INFORMATION (STAMP CRYSTAL UNIT WITH FREQUENCY SHOWN IN COLUMN INDICATED BELOW)	COLUMN S SERIES RESONANT FREQUENCY	DELTA FREQUENCY F PAR. -F SERIES	COLUMN P PARALLEL RESONANT FREQUENCY	RESONANCE LOAD CAPACITY	FREQ. TOL. AT OPERATING TEMPERATURE	OPERATING TEMPERATURE RANGE	FREQUENCY DEVIATION OVER OPERATING TEMP. RANGE	OPERABLE TEMPERATURE RANGE	TURNOVER TEMPERATURE	HARMONIC OF QUARTZ VIBRATION	RATED DRIVE LEVEL	PIN TO PIN CAPACITANCE MAX. UNLESS TOLERANCE INDICATES MIN. VALUE ALSO	MAXIMUM EFFECTIVE RESONANCE RESISTANCE AT OPERATING TEMPERATURE (OHMS) (SEE TEST NOTE 2)	REMARKS	USED ON MODEL
CR109-81	HC-6/U	A	COLUMN P	N/A	N/A	1.750000MC	13 pf	±.001% (25°C)	-40° TO +70°C	±.005%	N/A	N/A	FUNDAMENTAL	2.0MW	7.0 pf	130		CMRA-1
-82						1.756290MC												
-83						1.743710MC												
-84						1.295000MC	32 pf	±.002% (75°C)	75° ± 5°C	±.005%	0°C TO +90°C	75° ± 5°C	FUNDAMENTAL	5.0MW	3.0-4.0pf	4000 (75°C)		AFC-7
-85						10.34800 MHZ	32 pf	±.002% (75°C)	75° ± 5°C	±0.0005%	0°C TO +90°C	75° ± 5°C	FUNDAMENTAL	2.5MW	3.0-4.0pf	25 (75°C)		AFC-8
-86						N/A	15 pf	±.001% (25°C)	-10° TO +60°C	+5 TO -25 CPS	N/A	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	4000 (25°C)		CDN-3 (A4350)
-87						N/A	10 pf											(A4354)
-88						N/A	10 pf											(A4352)
-89						N/A	10 pf											CDN-3 (A4349)
-90						705.000KC	20 pf	±.001% (25°C)	-10° TO +60°C	+5 TO -25 CPS	N/A	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	4000 (25°C)		VOX-7 MMX-1 HFR 4
-91						N/A	20 pf	±.001% (25°C)	-0° TO +55°C	.002%	-10°C TO 60°C	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	500 Ω		VOX-7 MMX-1 HFR 4
-92						.800,000 MHZ												
-93						.900,000												
-94						1,000,000												
-95						1,100,000												
-96						1,200,000												
-97						1,300,000												
-98						1,400,000												
-99						1,500,000												
-100						1,600,000												
-101	HC-6/U	A				1,700,000												
-102	HC-6/U	A				1,800,000												
-103	HC-6/U	A				1,900,000												
-104	HC-6/U	A				2,000,000												
-105	HC18/U	C				2,100,000												
-106						2,200,000												
-107						2,300,000												
-108						2,400,000												
-109						2,500,000												
-110						2,600,000												
-111						2,700,000												
-112						2,800,000												
-113						2,900,000												
-114						3,000,000												
-115						3,100,000												
-116						3,200,000												
-117						3,300,000												
-118						3,400,000												
-119						3,500,000												
-120						3,600,000												
-121						3,700,000												
-122						3,800,000												
-123						3,900,000												
-124						4,000,000												
-125						4,100,000												
-126						4,200,000												
-127						4,300,000												
-128						4,400,000												
-129						4,500,000												
-130						4,600,000												
-131						4,700,000												
-132						4,800,000												
-133						4,900,000												
-134						5,000,000												
-135						5,100,000												
-136	HC18/U	C	S			13,200,000	20 pf	±.001% (25°C)	-0 TO 55°C		-10°C TO 60°C	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	500 Ω	Q= 50,000 ETC.	VOX-7 MMX-1
-137	HC6/U	A	S			10,000,000	20 pf	±.001% (25°C)	-0 TO 55°C		-10°C TO 60°C	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	500 Ω	Q= 50,000 ETC.	HFS-4
-138	HC 18/U	C	S			14,000,000	20 pf	±.001% (25°C)	-0 TO 55°C		N/A	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	500 Ω	Q= 50,000 ETC	MMX-1
-139	HC18/U	C	S			8,000,000	20 pf	±.001% (25°C)	-0 TO 55°C		N/A	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	500 Ω	Q= 50,000 ETC	MMX-1
-140	HC18/U	C	S			10,000,000	20 pf	±.001% (25°C)	-0 TO 55°C	.002%	N/A	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	500 Ω	Q= 50,000 ETC	MMX-1
-141	HC6/U	A	S			555.000 kHz	10 pf	±.001% (25°C)	-10 TO +60°C	+5 TO -25CPS	N/A	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	4000 (25°C)		CDN-3 (A4349)
-142						655.000 kHz												
-143						955.000 kHz												
-144	HC6/U	A	S			1.295000	10 pf	±.001% (25°C)	-10 TO +60°C	+5 TO -25CPS	N/A	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	4000 (25°C)		CDN-3 (A4349)
-145	HC6/U	A	P			N/A												
-146	HC6/U	A	P			N/A												
-147	HC6/U	A	S			0.250 MHz	20 pf	±.003% (25°C)	0°C TO +55°C	+0.03%	-10°C TO +60°C	N/A	FUNDAMENTAL	1.0 MW	10.0 pf	3000 Ω	Q=50,000 ETC	SME-6, CMR
-148	HC6/U	A	S			0.25629 MHz	20 pf	±.003% (25°C)	0°C TO +55°C	+0.03%	-10°C TO +60°C	N/A	FUNDAMENTAL	1.0 MW	10.0 pf	3000 Ω	Q=50,000 ETC	CMR
-149	HC6/U	A	S			0.24371 MHz	20 pf	±.003% (25°C)	0°C TO +55°C	+0.03%	-10°C TO +60°C	N/A	FUNDAMENTAL	1.0 MW	10.0 pf	3000 Ω	Q=50,000 ETC	CMR
-150	HC18/U	C	S			3,000,000	20 pf	±.001% (25°C)	0°C TO +55°C	.002%	-10°C TO 60°C	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	500 Ω		VOX-7
-151	HC18/U	STANDARD	S			5.50 MHz	20 pf	±.001% (25°C)	0°C TO +60°C	±.001%	N/A	N/A	FUNDAMENTAL	2.0 MW	5.0 pf	35 Ω	Q=50,000	HFR-4
-152	HC18/U	STANDARD	S			7.00 MHz	20 pf	±.001% (25°C)	0°C TO +60°C	±.001%	N/A	N/A	FUNDAMENTAL	2.0 MW	5.0 pf	30 Ω	Q=50,000	HFR-4
-153	HC18/U	STANDARD	S			10.50 MHz	20 pf	±.001% (25°C)	0°C TO +60°C	±.001%	N/A	N/A	FUNDAMENTAL	2.0 MW	5.0 pf	20 Ω	Q=50,000	HFR-4
-154	HC18/U	C	S			9.500,000MHZ	20 pf	±.001% (25°C)	-0 TO 55°C	.002%	N/A	N/A	FUNDAMENTAL	2.0 MW	7.0 pf	500 Ω	Q=50,000 ETC	

REQ'D.	ITEM	PART NUMBER	DESCRIPTION	SYMBOL
LIST OF MATERIAL				
THE TECHNICAL MATERIAL CORP. MAMARONECK, NEW YORK				
TITLE CRYSTAL UNIT, QUARTZ (SPECIALS)				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES		DRAWN 3/22/61	FINAL APPROVAL	DATE
CHECKED		DATE	DATE	DATE
ELECT. DES.		DATE	DATE	DATE
MECH. DES.		DATE	DATE	DATE
DECIMALS X ± .005 XX ± .01 XXX ± .005		FRACTIONS 1/64 ANGLES ± 9° 30'		CR109
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NOTES

CR109
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